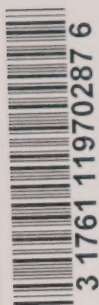


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Government  
Publications



# Royal Commission

on



# Electric Power Planning

THE TOTAL ELECTRIC POWER SYSTEM

ISSUE PAPER #7

APRIL 1977



Ontario



ISSUE PAPER #7

THE TOTAL ELECTRIC POWER SYSTEM

1. Introduction

2. System Description

3. System Load Characteristics

4. The Role of Generating Stations

5. Transmission Lines

6. Distribution System

THE TOTAL ELECTRIC POWER SYSTEM



## THE TOTAL ELECTRIC POWER SYSTEM

### Issue Paper #7

## THE TOTAL ELECTRIC POWER SYSTEM

### Introduction

- I. System Reliability
- II. Operational Concepts
- III. The Mix of Generating Stations
- IV. Interconnections

### Concluding Note



## THE TOTAL ELECTRIC POWER SYSTEM

### Introduction

Previous issue papers have been concerned with specific aspects of electric power planning, e.g., nuclear power, demand for electric power, land use, etc. This present paper will introduce issues which relate to the electric power system as a whole. Just as a poem is much more than a collection of individual disconnected lines, so is an electric power system much more than the collection of its individual components. Indeed, the concept of system e.g., solar system, telephone system, educational system, central nervous system, transportation system, etc., is very complex. Expressed as simply as possible a man-made system is an assembly of men, and machines and processes which has been designed to fulfill a specific societal need.

An electric power system is made up of men (and women), generating stations of several kinds, transmission lines, transformer and switching stations, a distribution network, a complex information processing and control system, and, of course, consumers. Its purpose is to supply a geographical region as reliably as possible with the electric power and energy needs of individual homes, industries, farms, institutions, etc., at "reasonable cost". The general consensus appears to be that Ontario Hydro is fulfilling this purpose effectively insofar as this province is concerned. And this is a major achievement when

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it is recalled that Ontario Hydro supplies electric power to 353 municipal utilities, to about 750,000 rural customers served directly by the Corporation and to 102 industrial customers also supplied directly.

Ontario's electric power system is in every sense of the word an evolutionary system. Early in its evolution the system was comprised essentially of the hydroelectric generation station at Niagara with transmission lines supplying Hamilton and Toronto. In those days electric power was measured in terms of hundreds of megawatts whereas today it is measured in tens of thousands of megawatts. The system, which is still evolving, has adapted, during the past seventy years, to the growing provincial requirements for electric power. Clearly, as the degree of economic and energy resource uncertainty increases, together with the length of construction lead times, the planning process becomes much more difficult.

This issue paper will be concerned essentially, as the title implies, with the system as a whole and especially with the interconnections and the interactions between the major components. Some aspects of the subject, notably system reliability and security of fuel supplies have been considered briefly in Issue Paper # 2 and 3 respectively. Related issues such as the need for excess generation capacity and the utilization of energy have also been introduced in these earlier papers. These topics will only be referred to briefly in this paper.

Ontario's electric power system is for the most part identifiable with Ontario Hydro. Nevertheless, there are important

contributions (amounting to a few percent) by the Great Lakes Power Company and other privately owned companies, mostly pulp and paper companies. An important point to note is that Ontario Hydro is one of the five largest public electric utilities in the western world. As of January 1976 its total generating capacity was almost 20,000 Megawatts (MW). For planning and administrative purposes the system is conveniently divided into two separate systems which are connected by a single bulk power transmission link. The "East System" which is by far the larger, covers the geographic regions of Southern, Eastern and most of North-eastern Ontario. The "West System" serves the Western and Northwestern areas of the province. The demarcation line between the systems corresponds roughly to a north/south line drawn through the community of Wawa which is located about 140 miles from Sault Ste. Marie. The east system's "bulk power transmission system" is essentially an integrated power grid system. As such the flexibility and reliability of the total system is enhanced. However, because of its complexity, the transmission system is not susceptible to rigorous analytical treatment and accordingly specific reliability indices cannot be established. In contrast, the west system is more readily identifiable with a simple linear system than with a network. Table I shows the "vital statistics" relating to the east and the west systems. A map of the Ontario Hydro system is shown in Fig. 1.

FIGURE 1

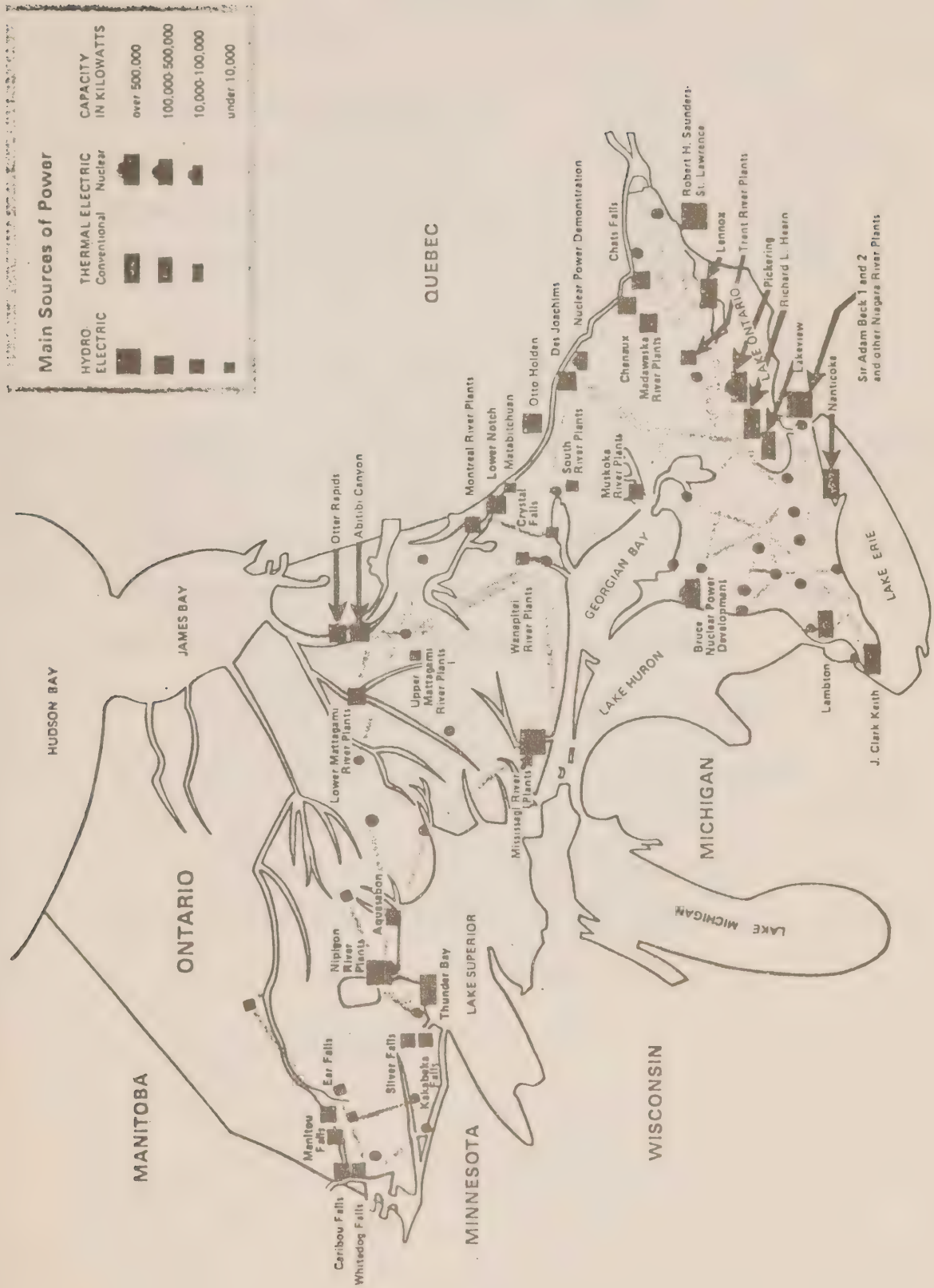




Table I  
Comparison of Ontario Hydro  
East and West Systems

	<u>East</u>	<u>West</u>
Generation Resources (Megawatts)	18,258	902
Number of Generation Sources	82	12
Miles of Bulk Power Transmission	2,100	9,100
Population of System Area	7,900,000	130,000

To put the Commission's mandate into its true time-frame it is important to note that generation, transmission, and associated facilities, planned during the period 1983-1993 will probably still be operational in 2020. In other words planning concepts on the "drawing board" today may be realized during the 1980's and many of them will have useful lives of at least 30 years.

The issues which relate to the system as a whole are introduced in the following sections under the headings: reliability; operational aspects; the mix of generating stations; system interconnections. As in previous issue papers several appendices have been included to provide comprehensive reference material which relates to these categories of issues.

I. System Reliability

High reliability of an electric power system is a very desirable characteristic especially in certain specialized uses of electric power. In Issue Paper #2, system reliability was introduced briefly from the points of view of the need for secure

fuel supplies as well as that of the reliable performance of the generating, transmission, etc., facilities, while in Issue Paper #3, the security of fuel supplies was also introduced in connection with thermal generation. As stressed in previous papers, some degree of overlap of topics between issue papers is not only inevitable it is also desirable.

If an adequate supply of "fuel" (hydraulic, fossil, uranium, etc.) is not continuously available an electric power system cannot be regarded as reliable. For the purpose of this paper we will assume that the fuel supplies are in fact secure and not a factor to be considered in an assessment of reliability. The other major factors, some of which will be considered in subsequent sections of this paper, which facilitate reliability are:

- i) A total system configuration (i.e., the generating stations, bulk power transmission lines, transformer and switching stations, etc.) which is sufficiently flexible and adaptable to cope with the majority of, for example, forced shut-downs of major facilities by continuing to provide electric power to virtually all consumers. If, for instance, the total system merely consists of a single massive generating station and a single ultra-high capacity transmission line (admittedly a completely unrealistic system), such a configuration would be totally unacceptable on reliability grounds because "outage" of either the generating station or of the transmission line would put the whole system out of action. On the other hand, if there were a multiplicity

of generating stations and an associated bulk power transmission network and distribution system, the total power system would continue to provide service even if several component breakdowns occurred simultaneously. It is interesting to note, analogously, that the "self-healing" properties of the human brain, for example, are predicated on a fantastically complex network of interconnected brain cells with the potential of vast numbers of "by-passes".

- ii) Adequate reserve generating capacity is a prerequisite of adequate total system reliability - this takes care of scheduled and unscheduled shutdowns (i.e., forced outages), of generating facilities.
- iii) Adequate bulk power transmission facilities as well as an adequately reliable distribution network and ancillary facilities.
- iv) Interconnections with contiguous electric power systems.
- v) Operating strategies which tend to facilitate "peak shaving", and which ensure optimum utilization of facilities;
- vi) Adequate maintenance of facilities;
- vii) Adequate monitoring and control of the power system network as a whole to ensure stable behaviour.

In addition to the system reliability issues which were identified in Issue Paper #2, the following issues are noteworthy:

- it has been suggested that under some circumstances a new planning philosophy based on "local energy centres" (i.e., centres embodying the capability of generating electric energy and thermal energy) may be more desirable than a continuation of a planning philosophy based on very large thermal generating stations (both fossil and nuclear-fuelled), from the standpoint of system reliability would such an alternative be acceptable?
- as pointed out previously, reliability depends in large measure on "generating reserve margins" as well as on a measure of redundancy in the bulk power transmission network; in order to minimize capital requirements to what extent should Ontario Hydro rely on increased "load-shedding", more frequent voltage reductions, and on increasing use of "interruptible power contracts"? In other words to what extent would decreasing the existing excellent level of performance of the system be acceptable?
- electric power peaking problems in Ontario are most severe during December and January. What is the optimum way of dealing with these, bearing in mind the period 1983-93 and beyond, - e.g., by building a few large generating stations and associated 500 kV transmission lines? or by building a comparatively large number of comparatively small generating facilities using combustion turbines, combined-cycle units, etc.?

## II. Operational Concepts

Some reference has already been made in Issue Papers #2 and #3 to two of the fundamental modes of operation of an electric power system. These were described as base-load generation and peak-load generation respectively; also mentioned were the types of generation best suited to these modes. In this section a rather more detailed introduction to such operational concepts, which relate to the system as a whole, will be introduced; bearing in mind always that the performance criteria of the system must be predicated essentially on reliability and cost factors.

The electric load on a power system varies from one second to the next. On a week-daily basis, the peaks in Ontario Hydro's east system load occur between 4.00 p.m. and 7.00 p.m., and on a yearly basis the annual peak will probably occur on a day in December or January during these peak hours. Because Ontario's electric power system (both east and west) is "winter-peaking", we find that the summer load profiles are at somewhat lower levels and roughly "parallel" to the winter load profiles. The average load in the east system during the night time hours, say 11.00 p.m. to 6.00 a.m., is usually at least 20% lower than the day time averages. However, the west system profile is much "flatter" because major industrial users, especially the pulp and paper industry, require electric power on a 24-hour basis. From both economic and technological standpoints, the desirability of "shaving the peaks" and "filling in the troughs" has been demonstrated unequivocally by many electrical utilities all over the world.

A very pertinent question is - what is the most economical and efficient way to operate an electric power system subject to varying demand patterns? Generating stations are designated to operate in one of four modes (not simply the two modes referred to previously): i.e., base load, intermediate load, peak load, and reserve. In Ontario, base load is supplied by hydraulic and nuclear stations, intermediate load by the more expensively fuelled oil and coal stations, and peak load by hydraulic stations and combustion turbine units. It will be noted that hydroelectric stations are used for both base load and peak load - their excellent load-following capability is very effective in the peaking operational mode. Note, however, that the availability of

hydroelectric units is sometimes limited because of the low water levels of, for example, the Great Lakes.

It is probably not widely known that the existing complexity of the total electric power system calls for a very sophisticated information monitoring and control system. This is required because unexpected disturbances (e.g., the sudden applications of a heavy electrical load or the overloading of a transmission line due to lightning) could jeopardize the security of the system as a whole - recall the major incident which occurred in November 1965. Because of the very brief time periods (often measured in fractions of a second) involved, human operators acting alone would have considerable difficulty in maintaining control of the system. For this reason computer-based control systems are essential. However, the major operating decisions are always in the hands of the human controllers, but the computer, not least because it provides "up to the second" information concerning such factors as system load, voltage levels and line outages in a readily readable form on TV display tubes, provides a virtually indispensable assisting role. Ontario Hydro's Richview Control Centre embodies computer control facilities and is said to be one of the most advanced systems in the world.

Another desirable characteristic of an electric power system is a capability of storing energy, usually in the form of hydraulic storage. The topic was introduced in Issue Paper #3. An energy storage capability, such as that at Niagara Falls, has great merit primarily because it reduces the amount of expensive fuels needed to meet power demands during peak periods - it is conservation

oriented.

Some of the specific issues which relate to operational strategies are:

- taking into account the different "load profiles", which exist between the east and the west system respectively, to what extent would a more closely integrated total system improve reliability levels in, for example, the west system?
- what are the operational implications of more dispersed (decentralized) and smaller generation facilities as contracted with a continuation of the existing trend towards large energy centres? What about the operational implications of a marked increase in industrial co-generation?
- to what extent might critical peak demands be decreased by an extension of the use of interruptible power contracts with industry?
- it has been suggested that, in order to reduce the need for additional capacity, selective use of "load shedding" might be introduced - to what extent would "rotating blackouts around the province" be acceptable to the public and to industry?
- with increasing experience, the operation of the Richview Control Centre may reduce the need for large generating "excess margins", and minimize additional transmission line requirements - is this a possibility? (This issue was raised by Professor Edward Davison during an information hearing.)

### III. The Mix of Generating Stations

It is well known that the survival of most "eco-systems" (i.e., naturally occurring and/or man-made systems in which life exists) is enhanced if the system is made up of a range of diverse components (e.g., plants, animals, air, water, soil, etc.). Such systems are usually more capable, than simpler systems of adapting to environmental disturbances. Nature in her wisdom encourages variety. The "law of requisite variety" is one of the most fundamental in nature. Not surprisingly, it applies to many

complex physical as well as to biological systems. We find, for example, that it is often desirable for complex physical systems to incorporate a degree of variety so that the catastrophic breakdown of one major component does not necessarily give rise to failure of the total system. Perhaps the concept might be referred to as "the eggs in one basket" syndrome. In the case of many electric power systems, for example, there is something to be said for incorporating a "mix" of generation technologies. If, for instance, a system were to be based exclusively on hydraulic power, or nuclear power, or on coal-fired generation, etc., certain situations (e.g., prolonged drought, shortage of fuels, etc.) can be envisaged which would seriously affect the operation of the whole system. Accordingly, from the point of view of improving system reliability, a mix of generating stations appears to be advantageous. This factor complements the fact that a mix of stations is usually preferable for dealing with the four basic operational modes referred to in the previous section. There are, of course, economic and environmental implications as well as reliability and operational implications to be taken into account. For the most part, these were treated in previous issue papers.

In Ontario, the existing "mix" includes hydroelectric, coal, oil, gas, and nuclear-fired thermal stations, combustion turbines, and diesel-powered generators. As of January 1976, the mix of generating stations operated by Ontario Hydro is shown in Table II.

TABLE II

<u>Type of Generation</u>	<u>East</u> <u>(MW)</u>	<u>West</u> <u>(MW)</u>
Hydraulic	5,574	576
Thermal		
- nuclear	2,284	
- fossil	8,816	97
- combustion turbine	388	29
Firm Purchases		
- Quebec	1,196	
- Manitoba		200
	<hr/>	<hr/>
Total	18,258	902

The choice of a specific type of generating station in a given region depends on many factors. Probably the most important are:

- i) The purpose of the station - is dual-purpose operation desirable and viable?
- ii) The security of fuel supplies and, especially if based on a renewable energy resource, the overall reliability of the station;
- iii) Cost factors - i.e., cost, interest rates, fuel costs, and the anticipated average cost of generation per unit of electric energy over the lifetime of the station;
- iv) The efficiency of the station and the anticipated load-factor;

- v) The anticipated environmental impact of the station on human health and on agriculture;
- vi) Availability of a suitable site in the preferred location (see Issue Paper #3, for siting criteria), bearing in mind the location of existing transmission lines - if new transmission lines are required what about the potential impact on agriculture?

Some of the issues which relate to the social costs and benefits of alternative methods of generating electric power have been introduced in previous Issue Papers, 2 and 3; the following complementary issues have particular relevance to the system as a whole:

- one of the important advantages (if not the most important), according to Ontario Hydro, of the nuclear power option is the security of fuel supplies (i.e., Ontario uranium and thorium). However, if Western Canadian coal-fired generation were to prove economically competitive with nuclear generation how would this affect power generation concepts?
- what are the potential operational implications (e.g., economic, reliability, network stability, peaking capability, etc.) for the total Ontario electric power system of an increasing number of industrial self-generation plants? Of increasing use of solar energy for space and water heating?
- could the "local energy centres", referred to in section I, if considered reliable and economically viable be integrated with the Ontario electric power system?
- what is the potential in Ontario for one or two "combined energy centres"? (A combined energy centre is one in which electric power, process steam, and thermal energy are generated and delivered to local industries.)

#### IV. Interconnections

Electric power systems are said to be interconnected when they can share, on a firm or interruptible basis, with contiguous power systems a portion of their generating capabilities. Each can "export" electricity to the other. In some cases, an example of which is the interconnection between Ontario Hydro's West and East Systems, the two systems are essentially part of a single major system. Also, within the province, Ontario Hydro is connected to the Great Lakes Power Company which services the Sault Ste. Marie area. In other cases such as, for example, the direct links between Ontario Hydro, Hydro Quebec, Manitoba Hydro and utilities in the states of New York and Michigan, each individual system is autonomous. Noteworthy too is the fact that Ontario Hydro, through the Northeast Power Coordinating Council (NPCC), is linked with most of the New England utilities and with New Brunswick. The advantages accruing to each of the interconnected utilities, especially from the standpoint of enhanced reliability, will be obvious.

The existing transfer limits for the transfer of electric power to and from Ontario Hydro are shown in Table III.

TABLE III

<u>Interconnection Transfer Limits</u>		
<u>Region</u>	<u>Import (MW)</u>	<u>Export (MW)</u>
Quebec	1300 - 1500	300 - 500
Manitoba	200 - 300	0 - 100
United States	1500 - 3000	1000 - 2500

It is important to note that Ontario Hydro is a net importer of electric energy (i.e., "imports" from Quebec, Manitoba and the United States exceed "exports").

In large measure the operating philosophies, associated with system interconnections, have evolved since the November 9, 1965, power failure which caused a major black out in Ontario and most of the northeastern United States. At the time of the incident, Ontario Hydro was receiving considerable power through an interconnection with New York at Niagara Falls. A protective relay(switch) failed and resulted in the removal from service of a major transmission line whose load was in turn switched to an adjacent line which also failed because of the resulting overload. A cascading effect resulted which caused a complete breakdown of the interconnected power systems. Subsequent to the incident the Northeast Power Coordinating Council was established - its primary purpose is to minimize the probability of such incidents recurring.

The significance of the part played by interprovincial and international (U.S.A.) interconnections in the Ontario Hydro system is exemplified below:

- i) The interconnections facilitate reliability and could give rise to a reduction in "reserve margins"(i.e., "excess" generating and transmission facilities needed to cope with scheduled and unscheduled outages);

- ii) Ontario Hydro has imported "firm power" from Quebec and Manitoba for several years - this amounts to 10-15% of its total load. Note that there is a possibility that imports will be reduced in the future.
- iii) During the summer months Ontario Hydro is in a position to export electricity to Michigan and New York utilities. This is possible because the United States utilities experience summer peaks while, during the summer, Ontario Hydro is experiencing an off-peak period. Ontario Hydro considers these sales to be both desirable and profitable. During the winter months the situation may be reversed and Ontario might import electricity from the United States;
- iv) Bearing in mind the fact that nuclear fuel is appreciably less expensive than the fossil-fuels the existing interconnections with the United States utilities frequently operate in such a way as to conserve fossil-fuels, and to optimize the use of nuclear power wherever it is available.
- v) Interconnections are particularly valuable when unforeseen circumstances give rise to a lowering of the generating capacity of a specific utility (e.g., the "cracked pressure tube" incidents at the Pickering Generating Station and the recent

mechanical stress problems at the Nanticoke Generating Station).

- vi) In times of momentary system emergencies, assistance will be provided to a neighbouring utility by Ontario Hydro "to the maximum extent deemed consistent with the safe and proper operation of its own system and with its price obligations to other Canadian systems".

The issues associated with interconnections which appear to be of central concern are:

- in assessing the desirable future levels of excess margins, to what extent should reliance be placed on a continuation of firm imports of power from Hydro Quebec and Manitoba Hydro? And on an interruptible power basis from United States utilities? In the latter cases it should be borne in mind that, especially during the current winter (1976-1977), the energy situation in the northeastern United States may be more serious than that in Ontario. What are the financial and economic costs and benefits of imports of electricity?
- from time to time it has been advocated that Ontario Hydro should build up its potential for exporting power to the United States - probably based on nuclear generation. On the other hand it has been argued that such a program would be environmentally unacceptable to Ontario. Bearing in mind the fact that the National Energy Board regulates all exports of electric power from Canada to the United States, to what extent should an export policy be pursued if at all? This issue obviously has many political, economic, and environmental ramifications. For example, what are the financial, economic and environmental costs and benefits of exporting electricity?
- would increasing emphasis on interprovincial electric power interconnections, perhaps with the ultimate goal of establishing a cross-Canada grid, be desirable? If so would d.c. interconnecting links be the preferred technology (see Issue Paper #4, Section VI)?

### Concluding Note

The object of this Issue Paper has not only been to introduce and explain the various public concerns which relate to Ontario's electric power system as a whole but also to stress the importance of thinking of the system as a total entity. Electricity generated at Nanticoke, or Lennox, or Pickering, etc., is available to every Hydro customer in the province. In other words, a local generating station does not merely supply its own locality. It is perhaps becoming increasingly important to think in terms not only of Ontario's total power system but also in terms of how Ontario can help, and be helped by, its neighbours, especially Quebec, Manitoba, New York and Michigan. It is only possible to fully appreciate the desirability of such interconnecting links in terms of a total picture. We hope this issue paper will enhance understanding of the "systems concept" and its great significance in Ontario's electric power system.



## APPENDICES

The attached appendices provide a sample of the comments relating to the Ontario Hydro system considered as a whole, with special reference to such factors as reliability, interconnections, etc., which were made during the Preliminary Public Meetings and the Public Information Hearings. References to the subject included in the Research and Background Papers prepared for the Commission are also presented. More detailed information on "the systems concept" is contained in the transcripts, memoranda, submissions, and research documents which are available in the Commission's Information Centre, 14 Carlton Street, Toronto, Ontario, M5B 1K5 and in the Regional Depositories located in the Main Libraries in Thunder Bay, Sudbury, London and Ottawa.



COMMENTS FROM THE  
PRELIMINARY PUBLIC MEETINGS

ON

THE TOTAL ELECTRIC POWER SYSTEM

I. System Reliability

"It is imperative that the power system of generation and distribution throughout the province be maintained in a dependable manner."

S-169

"We suggest that with the enormous capital costs that are being projected for the future, that perhaps the public should be prepared to take some calculated risks with reduced reserve capacity and therefore even some brownouts if necessary."

S-40

"Social safety is dependant on reliable electric service; i.e. street lighting, traffic control, elevators, smoke warning devices, hospitals, etc."

S-234

"Nobody likes power interruptions planned or unplanned as we all depend on it very much. However, it makes some difference when such interruptions occur when the temperature outside is fifty below (zero)."

S-192

"We would like, and have tried, to put a cost to society on energy we fail to deliver. We assess that in the average home it usually is just an inconvenience, but we have a strong conviction that in business and industry the cost is very large."

S-57

"Hydro's proposal is heavily committed to pursue the economies of scale. In the process it has sacrificed the economies of reliability."

S-58

"One generating unit of 500,000 kW is almost 7 times the demand load of the City of North Bay. When several of these units are put in one building, our faith in technology must be high."

S-24

"It is our belief that most interruptions of customer service are caused by local distribution and failures close to or inside the customer's property."

S-58

"If we are to ensure supplies of fuel, it is up to the Federal or Provincial governments to legislate for adequate supplies to be set aside for the Canadian people."

S-56

"We have some reservation about Ontario Hydro becoming involved in the exploration and development of the prime energy sources which they utilize for electric power generation."

S-28

"We see a need for some standardization of design, some packaging of major component units and blanket type approvals in order to reduce this time frame to the order of 5 years."

S-28

## II. Operational Concepts

"If power users could be persuaded to shift demand from peak to off peak hours, could not the need for increased capacity be alleviated to a considerable extent?"

S-218

"We...consider that a comprehensive review of scheduled and interruptible power rates will materially assist in establishing incentives for industries to manage their electrical loads to the mutual advantage of themselves and Hydro."

S-168

"Most power utilities including, I believe, Ontario Hydro, have been unwilling to increase the overall energy usage efficiency in combined heating and cooling simply because their mandate from Government has been to produce electrical energy at the lowest possible cost."

S-66

"A number of steps might be taken to improve the distribution of demand in order to achieve a more uniform use of facilities and thereby minimize the generation and transmission capacity needed merely to meet peaks."

S-58

## III. The Mix of Generating Stations

"For one thing, the giant plants and the grid pattern which arise as a result of putting into practice the so called "economies of scale" are themselves a problem to the environment and to the communities near them by being out of scale with the communities amongst which they live."

S-214

"The question of large "energy farms" as compared to smaller generating stations close to demand areas should be resolved. Bigness is not necessarily best..."

S-342

"Hydro must adapt its design philosophy to the North, not vice versa. In this area where industry is scattered over many thousands of square miles, it would seem advisable to build smaller stations each at a load site."

S-177

"What are the monetary, social and energy costs and benefits of centralized versus decentralized electric power production to the people of Ontario?"

S-89

"The use of combined-purpose power plants to provide district heating or industrial process heat has the further advantages of the reduction of local thermal pollution of natural water bodies and the reduction of air pollution in urban centers."

S-99

"We think the installation of large nuclear-electric energy centres will prove the most economical approach as load growth continues. However, the feasibility and economics of smaller nuclear-electric generating stations located close to urban or industrial centers combined with a district heating operation which would utilize the waste heat, should be investigated."

S-28

#### IV. Interconnections

"Significant economies may be achieved from planned power pooling between the provinces of Canada."

S-103

"Close proximity to Manitoba ought to suggest co-operation in electric power developments, including joint financing, and east-west power transfer."

S-177

"The utilities on both sides of the border can assist each other so that exports made in one year from Ontario to the United States might be repaid the next year, when Ontario runs into trouble."

S-287

"Considerations of a National Power Grid - because of our vast expanse as a nation, and our several time zones, what measures have or will be taken to see if excess capacity could be transmitted to peak areas across the nation."

"We need to learn why it seems so difficult to obtain from Quebec, more of the power which is surplus to that province's needs, and particularly with respect to power channeled into the Quebec system from Newfoundland's (Labrador) Churchill Falls project."

S-59

"We agree that every opportunity should be taken to reduce costs by increasing the profitable utilization of generation plants through sale to interconnected utilities. We also agree with the concept of power pooling where such power involves the sharing, and avoids the duplication of reserve capacity."

S-28

SOME REFERENCES TO  
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MADE DURING  
THE PUBLIC INFORMATION HEARINGS

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